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Erzion Model of Catalytic Nuclear Transmutation and Its Interpretation of Ball-Lightning and Other Anomalous Geophysical Phenomena

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Abstract

The principles that underlie the Erzion Model of catalytic nuclear transmutation are described. The Erzion Model permits the main anomalous features of Cold Fusion to be readily interpreted. Ball-Lightning and some other anomalous geophysical phenomena are interpreted in terms of this model. The fundamental and applied problems resolved with Erzion Model are indicated.

1. Introduction

Long before Cold Fusion discovery [1] I and my co-authors had proposed the hypothesis [2] of new massive stable hadrons existence in Universe for interpretation of large series of anomalous Cosmic Ray experiments. To put this hypothesis in accordance with Salam-Weinberg-Glashow Standard Elementary Particle Model G. Vereshkov could find the decision of this problem in terms of Gauge Mirror Model -Vereshkov Model (VM) by means of introduction of new massive mirror fermions (leptons and quarks) into Standard Model (SM) [3]. The lightest mirror untiquark ($\overline{U}$) can provide the existence of hypothetical stable massive meson doublet - erzions ($Э^- \equiv \{\overline{U}d\}$; $Э^0 \equiv \{\overline{U}u\}$). Moreover the existence of only one stable erzion nucleus singlet - enion ($Э_N \equiv \{\overline{U}uudd\}$) which can be considered as compound state of erzion and nucleon ($Э^- p$, $Э^0 n$) is possible in terms of VM. All the rest erzion nuclei are not stable and decay by nuclei lifetime ($\sim 10^{-20}$s) into erzions (enions) and usual nuclei. VM can create only one quark version of the hypothetical particles which does not contradict SM, Cosmology and Cosmogony and so all high energy physics and nuclear physics experimental results and results of new particle search at accelerators and in matter. Moreover it can explain large totality of anomalous experimental results not only in Cosmic Rays but in Astrophysics too: low solar neutrino flux; Jupiter radiation excess; catastrophic reducing of Li, Be, B contents in the abundance curve of Solar and Earth matter chemical elements; big flux of neutral high energy particles from local space sources [4]. And all these 15 years we are working constantly in the field of direct erzions search to decide is this hypothesis true or not [5].

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2. Erzion model of catalytic nuclear transmutation

From the beginning Cold Fusion (CF) has caused strong objections of orthodox scientists due to obvious contradictions of CF experimental results to the traditional theoretical notions. And it was very pleasant and surprise opportunity for us to give natural and straight scientific interpretation of CF experiments due to erzion (enion) nuclei interaction features [3,6].

During first year of CF investigation it was found out the following main CF features [7]:

1) running process unstationarity;
2) great ($\sim 10^5$) yield fluctuation;
3) attenuation and following unreproducibility;
4) yield suppression of neutron to tritium (10^3 - 10^{11}) and of tritium to energy ($\sim 10^3$);
5) new elements and isotopes production.

The Erzion Model (EM) of catalytic nuclear transmutation could give interpretation for all these CF features [8]. EM based on the assumption of enion-nucleus bounded state existence in matter with few concentration ($C \sim 10^{-21}$ - 10^{-16} nucl.$^{-1}$). Enions may be captured ($E_C \sim 1$ - 100eV) by small kind of some isotopes (donors) and are stored in this state rather long ($\sim 10^6$ - 10^9 years) until their release by nuclear interactions. Enions can be either relict enions or they can come to Earth in Cosmic Ray component. Erzion nuclei can not exist that's why enions and erzions take part only in exchange reactions, that is enion ($Э_N$) turns into erzion ($Э^-$ or $Э^0$), and erzion either changes its sign ($Э^0 \rightarrow Э^-$ or $Э^- \rightarrow Э^0$) or turns into enion ($Э_N$). Thus in principle it is possible to exist 6 different erzion-nucleus exchange reactions on every nucleus ($Э_N \rightarrow Э^0$; $Э_N \rightarrow Э^-$; $Э^0 \rightarrow Э_N$; $Э^0 \rightarrow Э^-$;$Э^- \rightarrow Э_N$; $Э^- \rightarrow Э^0$). In this case nucleus either loses nucleon (proton or neutron) or acquires nucleon or changes its sign (± 1) preserving nucleon number. In EM only 2 free parameters exist: enion coupling constants from $(Э^-, p)$ fusion and $(Э^0, n)$ fusion. If we know them we can compute all output energy for all 6 erzion-nucleus exchange reactions for all known isotopes. These enion coupling constants were chosen to provide running of deuterium fusion reactions with only tritium (T) generation and helium-3 generation prohibition. Moreover the tritium energy must be rather small (<0,1 MeV) for fast neutrons (~14 MeV) would not be generated by fusion reaction with deuterium. Good agreement of EM predictions with Rolison and O'Gredy results of palladium transmutation experiment showed possible truth of EM [9]. Further testing of EM was in good agreement with another nuclear transmutation results of CF experiments too [10].

Thus all output energies for all erzion nucleus exchange reactions for all stable [11] and unstable [12] isotopes had been calculated. It permits us to test the EM with all experiment results not only in CF but in Geophysics and Astrophysics too and to predict most optimum experiments.

3. Interpretation of ball-lightning and some other anomalous geophysical phenomena

Ball-lightning (BL) is the local (~10cm) stable (~100s) powerful (~1kW) cold plazmoid [13]. Although about 100 ball-lightning theoretic models exist there is not generally accepted among them (the same is in CF) because it is very difficult to give correct and obvious interpretation to such exotic phenomenon. We shall try to give simple principal interpretation of the main BL peculiarities in terms of EM.

Let us suppose that lightning discharge crushes tree and sets in fire and evaporates some decigrams of wood. On some conditions about billion ($\sim 10^9$) enions may become free (T~2000°C) and to turn on the following catalytic nuclear reactions among chemical elements (H, C, N, O) of evaporated wood:

$^1H(Э^-,Э^0)n$	+ 1,65 MeV	(100)	(1)
$^2H(Э_N,Э^0)^3H$	+ 0,11 MeV	(0,02)	(2)

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$^{2}H(Э^0,Э_N)^{1}H$	+ 3,9 MeV	(0,02)	(3)
$^{13}C(Э_N,Э^0)^{14}C$	+ 2,0 MeV	(1,1)	(4)
$^{13}C(Э^0,Э_N)^{12}C$	+ 1,2 MeV	(1,1)	(5)
$^{14}N(Э_N,Э^0)^{15}N$	+ 4,7 MeV	(100)	(6)
$^{14}N(Э^-,Э_N)^{13}C$	+ 0,25 MeV	(100)	(7)
$^{14}N(Э^-,Э^0)^{14}C$	+ 2,3 MeV	(100)	(8)
$^{15}N(Э_N,Э^-)^{16}O$	+ 4,3 MeV	(0,3)	(9)
$^{17}O(Э_N,Э^0)^{18}O$	+ 1,9 MeV	(0,04)	(10)
$^{17}O(Э^0,Э_N)^{16}O$	+ 2,0 MeV	(0,04)	(11)
$^{18}O(Э_N,Э^-)^{19}F$	+ 0,2 MeV	(0,2)	(12)

The isotope composition (%) is indicated in brackets assuming that composition of different chemical elements is the same.

Now let us suppose that average density of plazmoid matter will be a few more than air density. Then let us find out what reactions will be main in the erzion-nuclear transmutation cycle.

For neutral cycle ($Э_N \to Э^0 \to Э_N$) it will be (5) and (6) reactions:

$^{14}N(Э_N,Э^0)^{15}N$	+ 4,7 MeV	(100)	(13)
$^{13}C(Э^0,Э_N)^{12}C$	+ 1,2 MeV	(1)	

For charged cycle ($Э_N \to Э^- \to Э_N$) it will be (12), (9), (7) reactions:

$^{18}O(Э_N,Э^-)^{19}F$	+ 0,2 MeV	(0,2)	
$^{15}N(Э_N,Э^-)^{16}O$	+ 4,3 MeV	(0,3)	(14)
$^{14}N(Э^-,Э_N)^{13}C$	+ 0,25 MeV	(100)	

The mixed cycle ($Э_N \to Э^- \to Э^0 \to Э_N$) is possible too:

$^{15}N(Э_N,Э^-)^{16}O$	+ 4,3 MeV	(0,3)	
$^{18}O(Э_N,Э^-)^{19}F$	+ 0,2 MeV	(0,2)	
$^{1}H(Э^-,Э^0)n$	+ 1,65 MeV	(100)	(15)
$^{14}N(Э^-,Э^0)^{14}C$	+ 2,3 MeV	(100)	
$^{13}C(Э^0,Э_N)^{12}C$	+ 1,2 MeV	(1)	

It is evident from the isotope composition that the main cycle must be neutral cycle (13) if the cross-sections of reactions (1 - 12) don't differ each from other strongly.

To define cycle (13) power let us remember that such cycle frequency in condensed matter (PdD or TiD_2) is equal to ~ $10^{11}s^{-1}$ and in such a way the equivalent power must be equal to ~ 0,1W. Moreover let us remember that plazmoid matter density is 10^3 times less than condensed matter density and ^{13}C isotope concentration is equal to ~ 0,01. As a result we have the erzion cycle frequency of BL is equal to ~ 10^6s^{-1}, and the equivalent cycle power is equal to ~ 10^{-6}W.

The whole BL (10^9 enions) power is ~ 1kW. If we suppose that erzion velocity in (5), (6) reactions will be ~ $10^4 cm \cdot s^{-1}$ we can find erzion middle interaction range to be equal to ~ 0,1mm. It is much less than BL radius. But in such a way the middle BL life time must be only ~ 1s due to erzion diffusing. If BL kernel density was as condensed matter density, BL power would increase in proportion up to ~ 1MW, BL life-time - up to ~10^3s, and BL radius - up to ~ 10cm. If BL radius was ~ 1cm, BL life-time would be ~ 10s. This fact was noticed for artificial BL [13] at high voltage discharges in polymethylmethacrylat. At high voltage discharge in water it is possible to have free enion which can provide erzion nuclear cycle reactions on the H and O isotopes. The ^{17}O and ^{2}H densities are 10^3 times less than PdD system ones. That is why the cycle frequency will be ~10^8s^{-1} and cycle power will be ~ 10^{-4}W. Middle interaction range of neutral erzion ($Э^0$) in water will be ~ 1μm. If BL life-time is ~ 0,1s and about 100 erzions participate in this cycle than plazmoid radius is ~ 1mm and its power is ~ 10^{-2}W. It corresponds to results of paper [14]. Unknown radiation with wave lengths 795 nm and 743 nm (ε ~ 1.6 eV) may be interpreted as characteristic radiation of enions captured by ^{16}O nuclei in hot plasmoid matter. Wave length doublet is due to thin splitting of L-S interaction.

As it was shown earlier EM can give principal interpretation for BL phenomenon (just as natural so artificial) and can indicate BL main parameters (radius, life time, power) rather well. This BL interpretation with help of EM is not single. Earlier such interpretation was made in two different works [15] by means of different mechanisms of CF but these models introduced new elementary particles. It must be very symptomatic.

Except BL there are another geophysical anomalous phenomena, which can be interpreted in terms of EM. One of them is indication on abundance of tritium and ^3He concentration in the volcano eruption products [16]. It may be interpreted as the result of reaction (2) running in the Earth entrails. Another interest anomalous phenomenon is ^{13}C isotope impoverishment inside of diamonds of North Yakutia (-14‰) and Australia (-11‰), although carbon isotope discrepancy is not more than 3 - 5‰ in Earth entrails. This fact may be interpreted by reaction cycles (4), (5) initiated by enions released from ^{12}C donor after cracking of diamond crystal.

4. Conclusion

Interpretation of BL and other anomalous geophysical phenomena described in terms of EM of catalytic nuclear transmutation extends more the list of anomalous nature phenomena interpreted by EM and published earlier.

If resume all publications on this subject we can give the list of possibilities provided by EM:

1) Interpretation of anomalous experimental results in Cosmic Rays, Astrophysics and Geophysics;
2) Interpretation of anomalous CF peculiarities;
3) Creation and optimisation of energy sources;
4) Radioactive waste utilization;
5) Some stable chemical elements and isotopes production (He, Ne, Au).

All this demonstrates great opportunities of EM.

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